ELSEVIER

Volumes 130–131, 20 December 2002

Journal of
Materials
Processing
Technology

www.elsevier.com/locate/jmatprotec

Contents

Foreword 1

Sheet Metal Forming

Development of optimal layout design system in multihole blanking process 2
S.-B. Lee, D.-H. Kim, B.-M. Kim

Estimation of hole flangeability for high strength steel plates 9
D.I. Hyun, S.M. Oak, S.S. Kang, Y.H. Moon

Springback characteristics of the tailor-welded strips in U-bending 14
S.H. Chang, J.M. Shin, Y.M. Heo, D.G. Seo

Optimization of initial blank shape to minimize earing in deep drawing using finite element method 20
N. Kishor, D. Ravi Kumar

Formability analysis of extra-deep drawing steel 31
D. Ravi Kumar

Effect of process parameters on formability in incremental forming of sheet metal 42
Y.H. Kim, J.J. Park

Study on the forming parameters of the metal bellows 47
S.W. Lee

Optimization of sheet metal forming processes by the use of numerical simulations 54
G. Gantar, T. Pepelnjak, K. Kuzman

Modeling of the friction caused by lubrication and surface roughness in sheet metal forming 60
B.H. Lee, Y.T. Keum, R.H. Wagoner

Improving workability in ironing 64
Z. Kampuš, B. Nardin

Angle of contact between sheet and die during stretch–bend deformation as determined on the bending-under-tension friction test system 69
G.J. Coubrough, M.J. Alinger, C.J. Van Tyne

Application of intelligent design support system for multi-step deep drawing process 76
T.H. Choi, S. Choi, K.H. Na, H.S. Bae, W.J. Chung

Study on punch load of non-axisymmetric deep drawing product according to blank shape 89
D.H. Park, Y.M. Huh, S.S. Kang

Contactless on-line measurement of material flow for closed loop control of deep drawing 95
E. Doege, H.-J. Seidel, B. Griesbach, J.-W. Yun

The publisher encourages the submission of articles in electronic form thus saving time and avoiding rekeying errors. A leaflet describing our requirements is available from the publisher upon request.

CONTENTS direct

This journal is part of **ContentsDirect**, the ***free*** alerting service which sends tables of contents by e-mail for Elsevier Science books and journals. You can register for **ContentsDirect** online at: **http://contentsdirect.elsevier.com**

Elsevier Science B.V.

Preform design in hydroforming by the three-dimensional backward tracing scheme of the FEM 100
J. Kim, B.S. Kang, S.M. Hwang

Bursting for fixed tubular and restrained hydroforming 107
C.L. Chow, X.J. Yang

Study on the hydroforming process for automobile radiator support members 115
M.-Y. Lee, S.-M. Sohn, C.-Y. Kang, S.-Y. Lee

Prototype tryout and die design for automotive parts using welded blank hydroforming 121
Y.S. Shin, H.Y. Kim, B.H. Jeon, S.I. Oh

Finite element analysis of multi-stage deep drawing process for high-precision rectangular case with extreme aspect ratio 128
T.W. Ku, B.K. Ha, W.J. Song, B.S. Kang, S.M. Hwang

Implementing a modified Marciniak–Kuczynski model using the finite element method for the simulation of sheet metal deep drawing 135
S.H. Evangelista, J. Lirani, H.A. Al-Qureshi

Powder Forming/Composite

Design and manufacturing of fiber reinforced elastomeric isolator for seismic isolation. 145
B.-Y. Moon, G.-J. Kang, B.-S. Kang, J.M. Kelly

Modeling of compocasting process and fabrication of AZ91D magnesium alloy matrix composites 151
G. Sasaki, M. Yoshida, N. Fuyama, T. Fujii

Effect of product geometry on fiber orientation of compression-molded rib type products 156
S.H. Jo, E.G. Kim

Development of constitutive equations for plastic deformation of a porous material using numerical experiments 161
Y.-S. Lee

An integrated software environment for finite element simulation of powder compaction processes 168
A.R. Khoei

Modelling of powder compaction process using an endochronic plasticity model 175
A.R. Khoei, M. Mofid, A. Bakhshiani

A study for the constitutive equation of carbon steel subjected to large strains, high temperatures and high strain rates 181
Y. Lee, B.M. Kim, K.J. Park, S.W. Seo, O. Min

Thermo-mechanical analysis of ribbed strip rolling by a three-dimensional rigid–visco-plastic FEM. 189
Z.Y. Jiang, A.K. Tieu, C. Lu

Coupled thermal deformation analysis considering strip tension and with/without strip crown in coiling process of cold rolled strip 195
Y.J. Jung, G.T. Lee, C.G. Kang

A thermal mixed film lubrication model in cold rolling. 202
Y.J. Liu, A.K. Tieu

Numerical and experimental investigations of constrained groove pressing and rolling for grain refinement. 208
J.W. Lee, J.J. Park

Application of ANN for the dimensional accuracy of workpiece in hot rod rolling process 214
D.H. Kim, Y. Lee, B.M. Kim

Numerical modelling of the thermal deformation of CVC roll in hot strip rolling. 219
X.M. Zhang, Z.Y. Jiang, A.K. Tieu, X.H. Liu, G.D. Wang

Strategic FEM simulator for innovation of rolling mill and process 224
J. Yanagimoto

Metallurgical Processing

A study on prediction of bead height in robotic arc welding using a neural network. 229
I.S. Kim, J.S. Son, C.E. Park, C.W. Lee, Y.K.D.V. Prasad

Effect of chlorine on the tensile behavior of reactive-sintered TiAl–Mn alloys 235
S.-H. Yang, M.-S. Kim

Brazeability of cold rolled three layer Al–7.5Si/Al–1.2Mn–2Zn–(0.04–1.0)Si/Al–7.5Si (wt.%) clad sheets 240
J.-S. Ryu, M.-S. Kim, D. Jung

Influence of forming parameters on the final subgrain size during hot rolling of aluminium alloys. 245
X. Duan, T. Sheppard

Modelling of static recrystallisation by combining FEM with empirical models 250
T. Sheppard, X. Duan

Coating materials of TiN, Ti–Al–N, and Ti–Si–N by plasma-enhanced chemical vapor deposition for mechanical applications . . 254
I.-W. Park, K.H. Kim

Comparison for mechanical properties between TiN and TiAlN coating layers by AIP technique 260
S.-Y. Yoon, K.O. Lee, S.S. Kang, K.H. Kim

Properties of TiBN coating on the tool steels by PECVD and its applications 266
M.J. Son, S.S. Kang, E.-A. Lee, K.H. Kim

Deformation processing and mechanical properties of Cu–Cr–X (X = Ag or Co) microcomposites 272
J.S. Song, H.S. Kim, C.T. Lee, S.I. Hong

Thermo-mechanical processing and properties of Cu–Fe–Cr microcomposites 278
Y.S. Kim, J.S. Song, S.I. Hong

Synthesis and mechanical evaluation of nanocomposite coating layer of nc-TiN/a-Si_3N_4 on SKD 11 steel by sputtering 283
S.H. Kim, J.W. Jang, S.S. Kang, K.H. Kim

Casting

Characterization of heat insulating and lubricating ability of powder lubricants for clean and high quality die casting 289
R. Kimura, M. Yoshida, G. Sasaki, J. Pan, H. Fukunaga

A study on the development of large aluminum flange using the casting/forging process. 294
S.I. Wang, M.K. Seo, J.R. Cho, W.B. Bae

Influence of abnormal structure on the reliability of squeeze castings 299
R. Kimura, M. Yoshida, G. Sasaki, J. Pan, H. Fukunaga

Physical modeling of bubble generation in foamed-aluminum 304
S.M. Oak, B.J. Kim, W.T. Kim, M.S. Chun, Y.H. Moon

Injection moulding simulation results as an input to the injection moulding process 310
B. Nardin, K. Kuzman, Z. Kampus

Development of an integrated neural network system for prediction of process parameters in metal injection moulding 315
P.K.D.V. Yarlagadda

Powder injection molding of a 17-4 PH stainless steel and the effect of sintering temperature on its microstructure and mechanical properties 321
H.-J. Sung, T.K. Ha, S. Ahn, Y.W. Chang

Visualization analysis of flow front behavior during filling process of injection mold cavity by two-axis tracking system 328
H. Yokoi, N. Masuda, H. Mitsuhata

Polishing/Grinding/Cutting

Friction and thermal phenomena in chemical mechanical polishing. 334
H.J. Kim, H.Y. Kim, H.D. Jeong, E.S. Lee, Y.J. Shin

Intelligently automated polishing for high quality surface formation of sculptured die 339
J.H. Ahn, M.C. Lee, H.D. Jeong, S.R. Kim, K.K. Cho

Rigid-thermoviscoplastic finite element simulation of non-steady-state orthogonal cutting 345
D.-C. Ko, S.-L. Ko, B.-M. Kim

High strength FGM cutting tools: finite element analysis on thermoelastic characteristics 351
J.R. Cho, H.J. Park

A study on the precision machinability of ball end milling by cutting speed optimization 357
K.-K. Kim, M.-C. Kang, J.-S. Kim, Y.-H. Jung, N.-K. Kim

Rapid Prototyping

Development of rapid manufacturing process by high-speed machining with automatic fixturing 363
B.S. Shin, D.Y. Yang, D.S. Choi, E.S. Lee, T.J. Je, K.H. Whang

Functional prototype development: inner visible multi-color prototype fabrication process using stereo lithography 372
Y.G. Im, S.I. Chung, J.H. Son, Y.D. Jung, J.G. Jo, H.D. Jeong

Determination of optimal build orientation for hybrid rapid-prototyping 378
Z. Hu, K. Lee, J. Hur

Surface reconstruction for mid-slice generation on variable lamination manufacturing 384
S.H. Lee, D.G. Ahn, D.Y. Yang

A study on the chemical mechanical micro-machining (C3M) process and its application 390
J.M. Park, S.C. Jeong, H.W. Lee, H.D. Jeong, E.-s. Lee

A study on micro-grooving characteristics of planar lightwave circuit and glass using ultrasonic vibration cutting 396
J.-S. Lee, D.-W. Lee, Y.-H. Jung, W.-S. Chung

Evaluation of cutter orientations in 5-axis high speed milling of turbine blade 401
T.-S. Lim, C.-M. Lee, S.-W. Kim, D.-W. Lee

Extrusion/Wire Drawing

Extrudability improvement and energy consumption estimation in Al extrusion process of a 7003 alloy 407
H.-H. Jo, H. Cho, K.-W. Lee, Y.-J. Kim

Design for stiffness reinforcement in backward extrusion die 411
K.-D. Hur, Y. Choi, H.-T. Yeo

Effect of reduction ratio, inclusion size and distance between inclusions on wire breaks in Cu fine wiredrawing 416
H. Cho, H.-H. Jo, S.-G. Lee, B.-M. Kim, Y.-J. Kim

Measurement of pressure distribution on die surface and deformation of extrusion die in hot extrusion of 1050 aluminum rod . . 421
T. Mori, N. Takatsuji, K. Matsuki, T. Aida, K. Murotani, K. Uetoko

Investigation into the improvement of welding strength in three-dimensional extrusion of tubes using porthole dies 426
K.J. Kim, C.H. Lee, D.Y. Yang

Deposition of hard films on hot-working steel dies for aluminium 432
K.B. Müller

The influence by hydrostatic extrusion on the microstructure and extrudability of the IM processed hypereutectic Al–Si–X alloys 438
H.G. Jeong, D.J. Yoon, E.Z. Kim, H.J. Park, K.H. Na

Finite Element Method

A rigid–plastic hybrid element method for simulations of metal forming 444
Y.-M. Guo, K. Nakanishi

A finite-element simulation of asperity flattening in metal forming 450
B. Ma, A.K. Tieu, C. Lu, Z. Jiang

Finite element analysis of micro-rolling using grain and grain boundary elements 456
D.J. Kim, T.W. Ku, B.S. Kang

Finite element analysis on the effect of die clearance on shear planes in fine blanking 462
T.S. Kwak, Y.J. Kim, W.B. Bae

Finite element analysis of high strain rate superplastic forming (SPF) of Al–Ti alloys 469
P.K.D.V. Yarlagadda, P. Gudimetla, C. Adam

Finite element analysis for the lamination process of a precision motor core using progressive stacking dies 477
K. Park, S.-R. Choi

Construction of sliding constraint surfaces and initial guess shapes for intermediate steps in multi-step finite element inverse analysis 482
S.H. Kim, H. Huh

Cylindrical tube optimization using response surface method based on stochastic process 490
S.-H. Lee, H.-Y. Kim, S.-I. Oh

Finite element analysis of equal channel angular pressing of strain rate sensitive metals 497
H.S. Kim, M.H. Seo, S.I. Hong

Design sensitivity analysis of sheet metal forming processes with a direct differentiation method 504
S.H. Kim, H. Huh

Elastic–plastic finite element method simulation of thin strip with tension in cold rolling 511
Z.Y. Jiang, A.K. Tieu

Forging Process

Pass schedule algorithms for hot open die forging 516
P.H. Kim, M.S. Chun, J.J. Yi, Y.H. Moon

A study on the automated process planning system for cold forging of non-axisymmetric parts using FVM simulation. 524
B.K. Lee, H.H. Kwon, H.Y. Cho

Analysis of the elastic characteristics at forging die for the cold forged dimensional accuracy 532
Y. Lee, J. Lee, T. Ishikawa

Characterization of deformation stability in hot forging of conventional Ti–6Al–4V using processing maps. 540
N.-K. Park, J.-T. Yeom, Y.-S. Na

FE program development for predicting thermal deformation in heat treatment 546
J.W. Jang, I.-W. Park, K.H. Kim, S.S. Kang

Semi Solid Forming

The effect of test specimen size and strain-rate on liquid segregation in deformation behavior of mushy state material. 551
P.K. Seo, S.W. Youn, C.G. Kang

Semisolid strip casting using a twin roll caster equipped with a cooling slope 558
T. Haga

Forming and joining of commercial steel grades in the semi-solid state. 562
R. Kopp, J. Kallweit, T. Möller, I. Seidl

The rheological behavior for thixocasting of semi-solid aluminum alloy (A356). 569
X. Yang, Y. Jing, J. Liu

Mechanical characteristics evaluation of hollow shape part with metal matrix composites fabricated by thixoforging process . . . 574
S.W. Youn, C.G. Kang, P.K. Seo

Billetless simple thixoforming process. 581
T. Haga, P. Kapranos

Thixoforming characteristics of thermo-mechanically treated AA 6061 alloy for suspension parts of electric vehicles 587
S.-Y. Lee, S.-I. Oh

Simple rheocasting processes 594
T. Haga, P. Kapranos

CAD/CAE/CAM

Part decomposition for die pattern machining. 599
D. Ki, K. Lee

Development of simulation system for machining process using enhanced Z map model. 608
S.-K. Lee, S.-L. Ko

A grouping algorithm for custom-tailored products 618
S.-Y. Kim, K. Lee, T. Hwang

A study on the development of computer-aided process planning system for electric product with bending and piercing operations 626
C. Kim, Y.S. Park, J.H. Kim, J.C. Choi

Shape design of efficient retroreflective articles 632
B.S. So, Y.H. Jung, D.W. Lee

NC post-processor for 5-axis milling machine of table-rotating/tilting type 641
Y.H. Jung, D.W. Lee, J.S. Kim, H.S. Mok

Tool/Die Manafacturing Techniques

Integrated analysis for die design including brittle damage evolution 647
E.-G. Yoh, Y.-I. Kim, Y.-S. Lee, H.-J. Park, K.-H. Na

Development of design and manufacturing technology for end mills in machining hardened steel 653
Y.-H. Kim, S.-L. Ko

Development of a surface roughness measurement system using reflected laser beam. 662
H.Y. Kim, Y.F. Shen, J.H. Ahn

Tool wear measuring technique on the machine using CCD and exclusive jig 668
J.-H. Kim, D.-K. Moon, D.-W. Lee, J.-s. Kim, M.-C. Kang, K.H. Kim

Advanced Forming Technology

Vertical wall surface forming of rectangular shell using multistage incremental forming with spherical and cylindrical rollers. . . 675
H. Iseki, T. Naganawa

A study on the thermal behavior of fabrication processes for micro-accelerometer by SOI wafers 680
I.S. Kim, O.S. Kim, Y.J. Jeong, K.D.V. Prasad

Development and manufacturing of hexahedral type vibration motor used for mobile phone 685
H.J. Lee, S.U. Chung, S.M. Hwang, G.Y. Hwang, T.W. Ku, B.S. Kang

Fabrication of spray-formed hypereutectic Al–25Si alloy and its deformation behavior 691
T.K. Ha, W.-J. Park, S. Ahn, Y.W. Chang

Author Index 696
Subject Index 698